

RECYCLABLE PACKAGING – A STEP FORWARD FOR THE ENVIRONMENTAL SUSTAINABILITY WITH THE COST BENEFIT TO THE ORGANIZATION A CASE STUDY WITH REFERENCE TO AN INDIAN AUTOMOBILE INDUSTRY

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ABSTRACT

Packaging contributes to about 2-3% of the total Sales turnover in an automobile industry. It's an important, yet ignorant aspect of a Supply Chain. This area is not being focused so far as being considered at least priority business operation. But now its importance is very well recognized with the emerging concept of Green Supply Chain Management. Recyclable Packaging also termed as Green Packaging is a new dimension in packaging. It not only eliminates the use of Corrugated & Wooden Packaging, but also contributes to Cost Reduction. In a way, use of Recyclable Packaging restricts depletion of natural resources, thereby contributing to the environmental sustainability. The Study aims to identify the Different types of Recyclable Packaging available in the industry. It also Highlights the benefits in terms of Cost Saving and Reduced consumption of natural resources. A sample size of five Automotive Plants was selected for the study. Data Collection & Analysis was done to find out prevailing consumption pattern of conventional packing. Research carried out to explore feasible solution of the Recyclable Packaging. OEM Customers involved for approval and implementation. Result concluded after successful trial lots run followed by regularization.

KEYWORDS: GSCM, Recyclable Packaging, Automobile Industry, Supply Chain Management, Organizational Performance, Cost Saving & Green Packaging

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INTRODUCTION

Packaging is a waste contributor and must be taken care of during the design phase. There are two different types of Packaging: industrial packaging, which is required to protect the material or product as it flows through the supply chain until it reaches the retailer. The second one is consumer packaging, which is the final packaging for end consumers. The objective of the consumer packaging is a marketing and product protection. Both the Packaging's are important to avoid waste. Packaging cannot be avoided. In a case if we don't use the required significant packing protection, then it can have a bigger negative effect on the environment than the waste it was creating in the originating place. For example, in the textile industry, most of the product is transported by water route through boats & Ships. The primary packaging used is carton box. In this case if carton box leaks or condenses, the entire contents inside the carton can be rejected by the customer,

resulting in the product being scrapped or significant cost in redistribution or repair. As the result, the fashion industry will not be able to reduce the material used in the carton, but it is reusable.(Kumar, Teichman, & Timpernagel, 2012)

In the recent years, increased pressure from various stakeholders, such as regulators, customers, competitors, community groups, global communities, and non-governmental organizations (NGOs), have motivated companies to initiate environmental management practices not only at the firm level, but also throughout the entire supply chain (Masoumi K, Salwa Hanim, Ezutah Udoncy, & Raja Ariffin, 2015). This shift from the implementation of green initiatives at the firm level towards the whole supply chain, requires a broader development of environmental management from the initial sources of raw material to the end-user customers in both the forward and reverse supply chain (Masoumi K, Salwa Hanim, Ezutah Udoncy, & Raja Ariffin, 2015)and Recyclable Packaging is the key potential area for these green initiatives in these supply chains.

Now a day's there is a Huge Pressure on the organizations to implement green supply chains in response to a web of serious problems like global warming, environmental degradation, natural resource depletion, rising energy costs, interdependent global supply chains, and the outcry from consumers and governments, among other drivers (Angeles & Lane, 2011)

The “triple bottom line” approach calls for the firms to balance its pursuit of economic, environmental, and social performance in their initiatives. The “natural step” believes that “...in a sustainable society, nature is not subjected to systematically increasing concentrations of substances, extracted from the Earth's crust, concentrations of substances produced by society, or degradation by physical means and [where] people are not subject to conditions that systematically undermine their capacity to meet their needs....” (Angeles & Lane, 2011). The “ecological footprint” approach compares the environmental impacts of production activities with the known limits of the earth's natural resources and the capacity of its ecosystem functionality (Angeles & Lane, 2011)

The Green Clean Institute defines “green strategy” as an approach that results in the manufacture of green products and use of business practices that cause no immediate, residual, or long-term harm to the biosphere (Angeles & Lane, 2011) Other academics have defined a “green supply chain” somewhat similarly. Green et al. refers to it as the approach taken when environmental considerations are taken in pursuing innovation in supply chain management and industrial purchasing. Narasimhan and Carter focused on the role of the procurement function in the supply chain and view environmental supply chain management as the inclusion of reduction, recycling, reuse and the substitution of materials. Godfrey succinctly refers to green supply chain management as the practice of monitoring and improving environmental performance in the supply chain.(Angeles & Lane, 2011)

LITERATURE REVIEW

According to the London-based Committee on Climate Change (CCC) global greenhouse gas emissions must be reduced to below 50 percent of 2007 levels in order to keep the average temperature increase within 2°C by the year 2050. It will need the societies worldwide to develop consumption patterns that emit 50-to-80 percent less CO₂ than today. The role of the Industry is very much important in CO₂ emission reduction initiatives and key to the decarbonization of societal consumption. Efforts have been made to reduce greenhouse gas emissions, other pollutants, and wastages within the supply chains since the late 1980s and initiatives by large enterprises such as supermarket chains in the United Kingdom, Wal-Mart and other low-cost retailers in the United States and heavy industries such as automobile

manufacturing and aluminium smelting have attracted considerable attention.(Kjaer, Høst-Madsen, Schmidt, & McAloone, 2015)

Organizations with an ambitious sustainability agenda are starting to expand their efforts from reducing directly controlled environmental impacts within their own operations to also include a complete end to end supply chain embedded impacts.(Kjaer, Høst-Madsen, Schmidt, & McAloone, 2015) These companies recognize that the indirect impacts from consumption of raw materials, machinery, equipment and other supporting products and services can have a significant share of the total environmental impact related to the company's activities. The emerging field of green supply chain management depicts that a lot many companies experience a pressing need to know how other stakeholders in the value chain influence the environmental performance of the products or services that the company delivers to its customers.(Kjaer, Høst-Madsen, Schmidt, & McAloone, 2015)

An environmental footprint can be defined as “a measure of natural resource usage and environmental impacts for which a company or product is responsible within the entire life-cycle of all of its operations”.(CHOUDHARY & SETH, 2011)

Numerous researchers have focused on the increasing environmental issues and problems of resource depletion. Due to stricter governmental regulatory acts, many of the Indian automobile manufacturing industries like TATA motors, EICHER motors, Force motors, MAHLE Engine Components, Mahindra Two wheelers etc. have implemented ISO 14001 certification to reduce environmental degradation. In the global scenario, the customers and communities are demanding the environmentally friendly products and recyclable packaging.(CHOUDHARY & SETH, 2011)

At present, the Indian automobile industry has grown and it holds a promising position amongst the top ten, in the entire world. An Outstanding growth rate of 14.78% per annum (FY 2017-18) and production of more than 30 million units per annum, it may not be an exaggeration to say that this industry in the coming years may acquire a challenging position of “ amongst top three” in the world. Market Share of Automobile industry of India can be broadly classified under passenger vehicles, commercial vehicles, three wheelers and two wheelers. The automobile companies of India, Korea, Europe and Japan have a significant hold on the Indian market share.

The wide scope of Green Supply Chain Management ranges from implementing and monitoring the general environment management initiatives to a more creating or controlling practices implemented through various Rs (Reduce, reuse, Rework, Refurbish, Reclaim, Recycle, Remanufacture, Reverse logistics, etc.).(CHOUDHARY & SETH, 2011), to attain an effective GSCM, waste minimization is being considered as an important strategy.(CHOUDHARY & SETH, 2011)

Supply Chain Professionals can improve the environmental performance of the Purchased products and services by expressing environmental preferences through GSCM or so called “green procurement”. Environmental purchasing is defined as “ the activities that include the reduction, reuse and recycling of materials in the process of purchasing”.(CHOUDHARY & SETH, 2011) Buying decisions will have an impact on the green supply chain through the material purchases that are either recyclable or reusable, or have already been recycled.(CHOUDHARY & SETH, 2011)

Green Packaging consists of natural materials, which can be recycled, reused and are easily disposed of. An organization can achieve lower waste disposal costs, lower waste treatment costs and lower energy costs. In addition, green packaging generally requires fewer resources to manufacture and operate, so savings can be made of

energy, water, fuel and other natural resources.(CHOUDHARY & SETH, 2011)

THE CASE STUDY

The study was conducted in one of the leading Auto Component manufacturing Group in India.

The Automobile Group based out of India, is one of the largest integrated component manufacturers in India and a very strong global presence. It constitutes one of the world's largest global forging and integrated machining plants. It has diversified operations across Forging, Casting, Machining and Sub-Assemblies. The group is well equipped with world-class facilities across many countries in the world. The Group is well established and positioned in the Indian Auto and Non-Auto component markets.

Out of various Corporate entities of the group, We selected machining division/sub group, that comprise of 15 Plants on PAN INDIA. We further squeezed our target samples and choosing five plants located in Delhi NCR Region.

Packaging Consumption Pattern for these Plants were as Follows

Table 1: Packaging Consumption Pattern

Plant	Average Monthly Packaging Consumption (Lacs)
Plant 1	2.89
Plant 2	3.69
Plant 3	5.00
Plant 4	27.85
Plant 5	18.81
Total (Lacs)	58.24

Various Types of Packing Material Used in these Plants

Table 2: Types of Packing Material

Packing Polythene
Packing Tap Brown
Packing Tap Transparent
Stretch Film
Sea Freight Packing with Top & Bottom
Sea Freight Packing with Inner & Outer
C/Box Medium Size
C/Box Small Size
Packing Separater
Wooden Pallets
Polythine Bags
Pvc Packing Strip 3/4"
Packing Clip 3/4" (Tin)
Plywood Boxes
Corrugated Sheets
Corrugated Boxes
Thermocole Crate
Vci Tape Roll

All of the above Packagings were one time packaging & Not Reusable.

The Various types of Packaging Material in these five plants were catagorized in the 10 Major Packaging Commodity that constitutes to about 80% of Total Packaging Buying Value in these plants.

Bar Chart & Parato Chart drawn to explore priority significance :

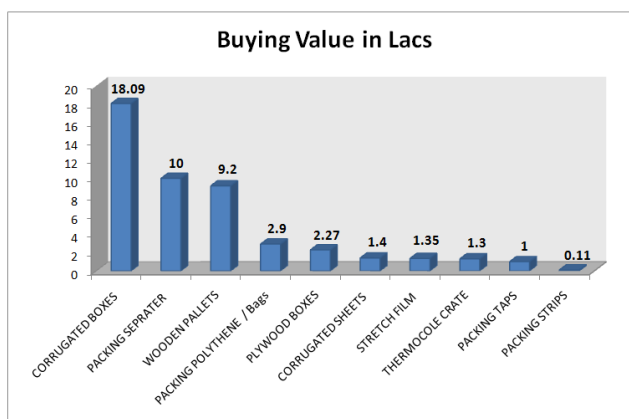


Figure 1: Bar Chart

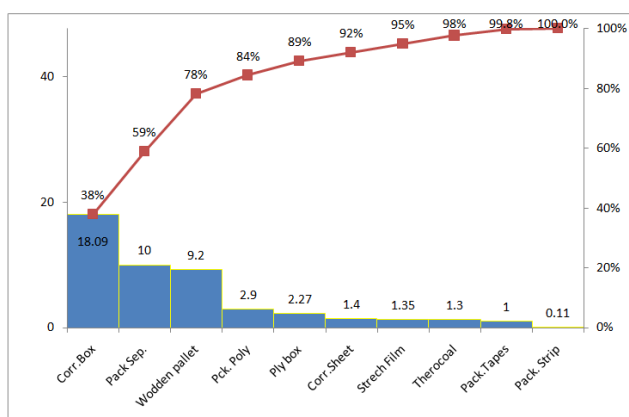


Figure 2: Parato Chart

Monthly Quantity Consumption Vs Buying Value for Top 10 Packaging Categories

Table 3: Monthly Quantity Consumption Vs Buying Value

Packaging Commodity	UOM	Consumption /Month (Quantities)	Buying Value /Month (Lacs)
Corrugated Boxes	Nos.	42500	18.09
Packing Separater	Nos.	576600	10
Wooden Pallets	Nos.	2000	9.2
Packing Polythene / Bags	Kgs	2000	2.9
Plywood Boxes	Nos.	110	2.27
Corrugated Sheets	Nos.	10000	1.4
Stretch Film	Kgs	1000	1.35
Thermocole Crate	Nos.	1000	1.3
Packing Taps	Nos.	4104	1
Packing Strips	Kgs	200	0.11

The Parato Analysis of Packaging Commodities further revealed that Top Five Packaging Commodities in this list

contributes to the Major Packaging Value. These Identified Commodities were Corrugated Boxes, Packing Separator, Wooden Pallets, Polythene Bags and Plywood Boxes.

The identified Commodities i. e. Corrugated Boxes, Separators, Plywood Boxes, and Wooden Pallets are a major source of depletion of natural resources i. e. Wood /Trees. While the last one, i. e. Polythene being Non biodegradable is a Major threat to Environmental Pollution.

Research was done to find out the feasibility of Alternate environmentally Friendly Recyclable Packaging. Customers were mapped in terms of their distance with the Plants and the Quantum of dispatches from these plants.

Customer Data Base Analysis

Table 4: Customer Data Base Analysis

Customer	Location
C1	NCR
C2	NCR
C3	NCR
C4	NCR
C5	Export
C6	Export
C7	Bangalore
C8	Punjab
C9	Punjab
C10	Pune
C11	NCR
C12	Pune
C13	Rudrapur
C14	Chennai
C15	Indore

Alternate Recyclable Packaging Options Explored

Table 5: Alternate Recyclable Packaging Options

Poly Propylene Boxes
HDPE Bins
Plastic Pallets
Metal Dunnages
Plastic Crates
Recyclable Wooden Boxes
FLC

THE SOLUTION AND RESULTS

Recyclable Packaging Specification, Life Cycle and Weight Carrying Capacity

Table 6: Recyclable Packaging Specification, Life Cycle and Weight Carrying Capacity

Recyclable Packaging	Specification	Dispatch Life Cycle	Weight Carrying Capacity
Poly Propylene Boxes Small	Foldable PP Boxes	11 -15 times	15 Kg Individual Boxes
Poly Propylene Boxes Big	Foldable PP Boxes	15-20 times	Upto 600 kg with Plastic Pallet

Table 6: Contd.,			
HDPE Bins	Foldable & Non Foldable both options	2-3 Years	15 Kg Individual Boxes
Plastic Pallats	Moulded Plastic Pallats	2-3 Years	1000 -1500 kg
Metal Dunnages	Iron / Steel Customized Dunnages	2-3 Years	1000 -1500 kg
Plastic Crates	Foldable & Non Foldable both options	1-2 Years	15 Kg Individual Crates
Recyclable Wooden Boxes	Foldable Wooden Boxes	3-4 times	200-300 Kg
FLC	Integrated Plastic Box with Pallat	2-3 Years	1000 -1500 kg

Based on above data facts, Customers were involved in the discussion & suitable Recyclable Packaging Proposal was finalized. Customized Solutions were proposed for various customers as per their specific need, distance from dispatch plants and quantum of daily, weekly and monthly dispatches.

Table 7

Customer	Location	Dispatch Frequency	Recyclable Solution Proposed
C1	NCR	Daily	HDPE Bins
C2	NCR	Alternate Days	Customized Iron Dunnages
C3	NCR	Alternate Days	HDPE Bins
C4	NCR	Weekly	HDPE Bins
C5	Export	Monthly	Not Feasible
C6	Export	Monthly	Not Feasible
C7	Bangalore	Weekly	PP Boxes with Plastic Pallat
C8	Punjab	Weekly	PP Boxes with Plastic Pallat
C9	Punjab	Weekly	PP Boxes with Plastic Pallat
C10	Pune	Weekly	FLC
C11	NCR	Alternate Days	Customized Iron Dunnages
C12	Pune	Weekly	FLC
C13	Rudrapur	Weekly	PP Boxes with Plastic Pallat
C14	Chennai	Weekly	PP Boxes with Plastic Pallat
C15	Indore	Weekly	PP Boxes with Plastic Pallat

Going forward, following three Challenges observed in the implementation :

- Initial Investment of Recycable Packaging was high as compared to monthly Packaging Cost.
- Reverse logistics arrangement & cost calculation
- Monitoring & maintenance of Recyclable Packaging

We could derive the following solution to the above challenges:

Existing Logistics service providers were asked to Invest in the Recyclable Packaging. They were also given a contract for Reverse logistics as well as monitoring and maintenance of Recyclable Packaging. This solution was a kind of Third Party equipment service provider. Packaging Cost per Product was fixed with these providers and Monthly Billing system was agreed. The Cost finalized was a combination of ammortization cost on account of Initial Investment, Operational Cost on the account of monitoring & maintenance of Recyclable Packaging and Reverse Logistics Cost. In some cases Advance was also provided to these providers to take care of initial investment and that advance was

payable in installments against the monthly billing payments. This solution was a win win solution for both the Plants as well as service providers.

The plant got the benefit in terms of Reduced Packaging Cost per product with No Load of Initial Investment and No Resource engagement for regular monitoring & upkeep of Recyclable Packaging. Whereas The Service Provider got benefit in terms of enhanced Business Profiles and profit sharing in Recyclable Packaging Module.

With the Implementation of Recyclable Packaging use of Corrugated Boxes, Plywood Boxes, Packing separators & Polythene was eliminated. It also contributed to environmental sustainability by reducing consumption of natural resources.

Packaging Cost Saving

Table 8: Packaging Cost Saving

Plant	Average Monthly Packaging Cost (Lacs)		
	Before	After Implementation of Recyclable Packaging	Cost Saving
Plant 1	2.89	2.1	0.79
Plant 2	3.69	3.2	0.49
Plant 3	5	4.2	0.8
Plant 4	27.85	20.6	7.25
Plant 5	18.81	15.2	3.61
Total (Lacs)	58.24	45.3	12.94
Over all % Saving			22.21%

Contribution to Environmental Sustainability – Reduced Consumption of Wood – Trees Saved

Pallats - To find out how many trees can be saved every year, we need to find out how much wood or lumber is used in a standard pallet and how much lumber can be produced from a normal size log. For calculation purpose, we estimated that two 10' logs can be produced from one tree. With those figures we can find out how many trees can be saved every year by recycling wooden pallets. The quantity of lumber used in a standard 48 x 40 GMA pallet is 15.17 board feet of lumber grossely. For a 10' log with a diameter of 14", the board footage in that log will be 63 BF. If we take 63 feet of lumber from a log and divide it by 15.17 BF required for the pallet we can produce just over 4 pallets from each log. By then assuming the 350,000,000 pallets recovered each year and dividing it by 4 pallets per log, we assume that around 87,000,000 logs that have been used to produce these pallets. If we are able to get two logs from every tree, we would save 43.5 million trees each year. By recycling 350 million pallets a year, we can save around 43.5 million trees that would be needed to produce these pallets. Without this recycling effort, raw material costs would greatly increase and the supply of available lumber would quickly diminish. (Nelson) (Source : The Nelson Technical Centre, Baltimore)

Corrugated Boxes - The most common box made (and the most "average" in size) is of standard 12" x 12" x 12" box.

That box typically uses just over eight square feet of corrugated cardboard per box (remember, we have to account for the flaps on the top and bottom of the box).

$20,619 \text{ sq/ft of corrugated cardboard} \div 8 \text{ sq/ft of corrugated cardboard per box} = 2,577 \text{ boxes per ton.}$

17 trees = 1 ton of corrugated cardboard.

17 trees = 2,577 boxes

1 tree = 151.6 boxes

(Source: 2010 EPA Report)(EPA, 2010)

Few Recyclable Packaging Snaps



Figure 3: Recyclable Packaging Snaps

CONCLUSIONS

This research paper aimed at finding out the feasible recyclable packaging solutions against the use of conventional non reusable corrugated, wood and polyethylenepackaging. We catagorized prevailing packaging commodities in sample industry /plants and prioritize them with reference to their buying value. Alternate Options for Recyclable Environment friendly Packaging explored and feasibility check was done for implementation. OEM Customers were involved in final decision /approval process. Logistic service providers were involved in the implementation, reverse logistics, monitoring & maintenance of recyclable packaging. Cost Savings wereachieved along with intangible benefits like improved packaging standard, reduced in transit damages and improved handling. It also contributes to the environmental sustainability & carbon footprints

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